BRAINWARE UNIVERSITY

Course – BTECH (CS)

DATA STRUCTURE AND ALGORITHM (BCSE201)

(Semester – 2)

Time allotted: 3 Hours   **Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Questions)   10 x 1 = 10

1. *Choose the correct alternative from the following*
(i)   What is the best case time complexity of insertion sort?
    a. O(1)   b. O(n)
    c. O(n log n)   d. $O(n^2)$
(ii) What is the equivalent postfix expression for *d / (e + f) + b * c*?
    a. defbc/++*   b. def+/bc+*
    c. def+/bc*+   d. None of these
(iii) The following sequence of operations are performed on a stack:
          push(A), push(B), pop, push(A), push(B), pop, pop, pop, push(B), pop.
    What is the correct sequence of popped out values?
    a. B, B, A, B, A   b. B, B, A, A, B
    c. B, A, B, B, A   d. B, A, B, B, B
(iv) Which data structure is used to implement Breadth-first-search algorithm?
    a. Stack   b. Queue
    c. Binary tree   d. None of these
(v)   What is the number of edges in a complete graph with 'n' vertices?
    a. n (n – 1)   b. n (n – 1) / 2
    c. n^2 d. 2n – 1
(vi) In which binary tree, for every node the heights of its left sub-tree and right sub-tree differ at least by one?
    a. Binary search tree   b. AVL tree
    c. Complete tree   d. Threaded binary tree
(vii) Fibonacci function *fib (n) = fib (n –1) + fib (n – 2)* is an example of
    a. Linear Recursion   b. Binary Recursion
    c. Non-linear Recursion   d. Mutual Recursion
(viii) How many pointer exchange should be required to insert a new node after a given node in a doubly linked list?
    a. Four pointer exchanges   b. Two pointer exchanges
    c. One pointer exchanges   d. No pointer exchange

(ix)   Which of the following methods had the best average case complexity for searching?
      a. Hashing   b. Sequential search
      c. Random search   d. Binary search

(x)   The technique of linear probing for collision resolution can lead to
      a. Clustering   b. Efficient storage utilization
      c. Underflow   d. Overflow

Group – B

(Short Answer Type Questions)   3 x 5 = 15

Answer any *three* from the following

2.   What is the difference between Static and Dynamic Data Structure? Explain with an example.   [5]

3.   Write an algorithm or a function in C Programming Language to reverse a Singly-linked list physically links.   [5]

4.   Convert the following infix expression to postfix notation by showing the operator stack and output string after reading each input token:
$$A * B + C * (D – E) - F * G$$ [5]

5.   "Binary search technique cannot be implemented using Linked list." - Justify the validity of the statement.   [5]

6.   (a)   Consider the array int a[10][10] and the base address 2000, then calculate the address of the array a[2][3] in the row and column major ordering.   [3]
     (b)   Write the advantage of a circular queue over a linear queue.   [2]

Group – C

(Long Answer Type Questions)   3 x 15 = 45

Answer any *three* from the following

7.   (a)   Define Abstract Data Type (ADT).   [2]
     (b)   Show the implementation of the stack data structure using linked list.   [6]
     (c)   What is Circular queue?   [2]
     (d)   Write *Q*-insert algorithm for the circular queue.   [5]

8.   (a)   Show the steps in creation of a height balanced binary AVL TREE using insertion of items in the following order (show all the balancing steps)
          (March, May, November, August, April, January, December, July, February, June, October, September)   [10]
     (b)   What do you mean by a *B*-Tree and what are the uses of such a tree in data structures?   [5]

9.   (a)   Explain the operation of Quick Sort algorithm with a suitable example.   [5]
     (b)   In which cases, Quick Sort becomes a 'Slow Sort'? What is the remedy in those cases?   [5]
     (c)   Compare the performance and operation between "Bubble Sort" and "Selection Sort".   [5]

10. (a) What do you mean by hashing? [2]
    (b) What are the applications where you will prefer hash tables to other data structures? [3]
    (c) What do you mean by collision in hashing? Name different collision resolution technique? [6]
    (d) Write the recursive function for the problem of Tower of Hanoi problem. [4]
11. Write short note on any three of the following. [3x5]
    (a) Radix sort.
    (b) Asymptotic Notation.
    (c) Tail recursion.
    (d) Threaded binary tree.
    (e) BFS *vs* DFS.